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# National Bureau of Standards

## TECHNICAL NEWS BULLETIN

FEBRUARY 1946

No. 346

### Wartime Radio-Observing Projects

During the war, radio amateurs of the United States participated in three observing projects sponsored by the Bureau, the object of which was to obtain basic data urgently needed in making radio propagation predictions for the Allied Armed Forces. The first two projects called NBS-ARRL projects I and II, were organized under the joint auspices of the National Bureau of Standards and the American Radio Relay League, the national organization of the radio amateurs of the United States, and most of the participating observers were ARRL members. The third project, known as the WWV Observing Project, was organized independently of the NBS-ARRL projects, but was later joined by a number of NBS-ARRL Project II participants.

NBS-ARRL Project I was started on July 1, 1941, and terminated on June 30, 1943. Project II ran from July 1, 1943 to June 30, 1944. "Regional Coordinators," selected by the ARRL headquarters staff, organized amateurs in their vicinities into observation groups for monitoring the radio-frequency spectrum between 1,500 and 30,000 kilocycles for two 2-hour periods each week, one in the daytime around noon, and one after dark.

The intensity, readability, and background noise intensity, as well as the distance and direction of each observed station, were reported to the Bureau, where the data were analyzed and the results used in checking predictions of world-wide radio propagation conditions

for the Allied Armed Forces and commercial radio communications companies engaged in war work.

The WWV Observing Project was organized in December 1943 and terminated on June 30, 1945. Its object was to obtain data on the reception of the Bureau's standard-frequency broadcast station WWV at various distances and in different directions. Observers were recruited from amateur and professional radiomen who had expressed an interest in the WWV broadcasts, and later from participants in the NBS-ARRL projects. Observers were requested to tune in on WWV as often as possible at approximately one-hour intervals and to record ratings of the intensity, readability, fading, and background noise intensity. The results of this project were also used in checking predictions of world-wide radio propagation conditions.

Most of the participants in these projects had regular full-time jobs and were therefore able to make their observations only during spare time. Many went without sleep to maintain their observing schedules and used precious hours on Sundays and days off, but they did it gladly as a patriotic service without thought of pay or recognition.

Through these projects United States radio amateurs contributed data to the war effort that could have been obtained in no other way. In addition, they have increased the sum total of knowledge of radio wave propagation and communication, and this will benefit everyone in days to come.

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### High Polymers—A New Field of Science

Fundamental research on seemingly diverse products—rubber, textiles, paper, leather, and plastics—is being integrated through the application of the methods and techniques of the new science of high polymers. Basically, the different substances made up of large organic molecules have much in common whatever

their practical form and application. The same apparatus and methods can ordinarily be used to measure the various electrical, thermal, thermodynamic, and optical properties. Likewise, many of the same procedures and the same reactions are used in the determination of the composition, molecular weight, molecular dimensions, and structure of all the large molecules.

The molecular properties of high polymers, far from being only of academic interest, are rapidly becoming

of commercial importance. Various synthetic plastics and rubbers are now being bought and sold on the basis of molecular weight and related properties. Hence, it is necessary for the Bureau to acquire equipment and develop techniques for making these measurements, and to establish standards for the use of science and industry.

In order to keep pace with developments in this new field, a Colloquium on High Polymers is being conducted as a part of the Bureau's educational program. Meetings are held one evening each week under the sponsorship of Dr. Robert Simha, a well-known authority on the subject who has recently joined the staff of the Organic and Fibrous Materials Division.

The speakers at the Colloquium include scientists from outside Washington who are working in academic institutions or industrial research laboratories, and also members of the staff of the Bureau, the Naval Research Laboratory, the Office of Rubber Reserve, the Milton Harris Associates, and the local universities. The topics covered have been coordinated under the general headings—(1) properties of solutions of high polymers, (2) physical properties of rubber, plastics, and fibers, and (3) the mechanism of formation and degradation of long chain compounds. These topics have been selected to cover fields in which the Bureau is actively engaged or is planning future work.

Out-of-town speakers at the Colloquium include some of the foremost workers in the field, and when they are in Washington arrangements are usually made for them to spend additional time in consultation on the Bureau's work in their respective fields of specialization. The expenses of these speakers are defrayed by a fee paid by the regular members of the Colloquium, and administered by the Bureau Educational Committee. Occasional visitors are welcomed to the Colloquium without charge.

## Effect of Added Materials on Dicalcium Silicate

Dicalcium silicate,  $2\text{CaO} \cdot \text{SiO}_2$ , is one of the major constituents of portland cement; it is found also in blast furnace slags and in certain refractories developed from lime and dolomite. A knowledge of its properties is, therefore, important to manufacturers and users of these industrial products.

There are three enantiotropic forms of dicalcium silicate: alpha, beta and gamma. It is only recently, and under special conditions, that alpha dicalcium silicate (the highest temperature form) has been observed in material at room temperature. The beta form, which has hydraulic properties, is a valuable constituent of portland cement, whereas the gamma form does not react with water and is therefore undesirable. An increase in volume of about 10 percent accompanies the beta-to-gamma inversion of  $2\text{CaO} \cdot \text{SiO}_2$ . If this inversion occurs, it may result in the destructive expansion or crumbling to a fine pow-



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Henry A. Wallace, *Secretary*

NATIONAL BUREAU OF STANDARDS

E. U. Condon, *Director*

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der (dusting) of materials containing substantial quantities of unstabilized beta dicalcium silicate.

It has been observed that  $\text{Cr}_2\text{O}_3$ ,  $\text{B}_2\text{O}_3$ ,  $\text{P}_2\text{O}_5$ ,  $\text{V}_2\text{O}_5$ , or  $\text{As}_2\text{O}_5$  prevent the beta-to-gamma inversion when present in comparatively small quantities. These materials have been termed chemical inhibitors, and the explanation is that they prevent the transformation by entering into solid solution with  $2\text{CaO} \cdot \text{SiO}_2$  at high temperatures. Being insoluble in the low-temperature, or gamma form, they must be ejected before the inversion to this low temperature form can occur. At the temperature of the inversion the rate of exsolution is very slow, the beta-to-gamma transformation does not take place, and the undesirable dusting is prevented.

The temperature of the alpha-beta inversion has been found to be sensitive to variations from the molar ratio  $2\text{CaO} : \text{SiO}_2$ . By means of heating curves it was possible to observe not only the effects of chemically undetect-

ible variations from the 2:1 ratio, but also the effects of small additions of other oxides, the limits of solid solution of these oxides in alpha  $2\text{CaO} \cdot \text{SiO}_2$ , and the formation of additional crystalline phases. Several investigators have made such measurements, and, as a continuation of earlier work at the Bureau, a paper by E. S. Newman and Lansing S. Wells is presented in the February number of the Journal of Research (RP1696) giving the result of studies of the individual effects of  $\text{CaO}$ ,  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{MgO}$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{CaF}_2$ ,  $\text{TiO}_2$ ,  $\text{BaO}$ ,  $\text{Cr}_2\text{O}_3$ ,  $\text{B}_2\text{O}_3$ ,  $\text{Mn}_2\text{O}_3$ ,  $\text{V}_2\text{O}_5$ ,  $\text{P}_2\text{O}_5$ ,  $\text{Na}_2\text{O}$ , and  $\text{K}_2\text{O}$  on the temperature of the alpha-beta inversion of dicalcium silicate. Observations were made of the extent to which these materials prevented dusting and of phenomena caused by the presence of phases other than dicalcium silicate.

The limits of solubility of  $\text{Al}_2\text{O}_3$ ,  $\text{MgO}$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{CaF}_2$ , and  $\text{TiO}_2$  in alpha  $2\text{CaO} \cdot \text{SiO}_2$  were estimated to be 0.5, 0.5, 1.0, 0.7, and 1.0 percent, respectively. The limits of solubility in beta  $2\text{CaO} \cdot \text{SiO}_2$  must be less, because the temperature of the inversion was lowered. None of these materials prevented dusting.

The limit of solubility of  $\text{BaO}$  or  $2\text{BaO} \cdot \text{SiO}_2$  in dicalcium silicate was not reached. Other investigators have reported that  $2\text{CaO} \cdot \text{SiO}_2$  and  $2\text{BaO} \cdot \text{SiO}_2$  form a complete solid solution series, and the data now obtained support that conclusion in the range of composition studied. Dusting was prevented by  $\text{BaO}$ , but only in additions of 10 percent or more.

The limits of solubility of  $\text{Cr}_2\text{O}_3$ ,  $\text{B}_2\text{O}_3$ ,  $\text{Mn}_2\text{O}_3$ ,  $\text{V}_2\text{O}_5$ , and  $\text{P}_2\text{O}_5$  in alpha  $2\text{CaO} \cdot \text{SiO}_2$  were estimated to be 2.5, 8.0, 8.0, 0.5, and 1.0 percent, respectively. Preparations containing these materials gave evidence of their solubility in beta  $2\text{CaO} \cdot \text{SiO}_2$  by changes of color or of refractive index, and by the absence of dusting. The limits of solubility of both  $\text{B}_2\text{O}_3$  and  $\text{Mn}_2\text{O}_3$  in beta  $2\text{CaO} \cdot \text{SiO}_2$  were estimated not to exceed 4.0 percent.

The volatility of the alkalis  $\text{Na}_2\text{O}$  and  $\text{K}_2\text{O}$  hindered the study of their effects on  $2\text{CaO} \cdot \text{SiO}_2$ , and no estimate of the limit of solubility of  $\text{K}_2\text{O}$  was made. It was estimated that the limit of solubility of  $\text{Na}_2\text{O}$  in alpha  $2\text{CaO} \cdot \text{SiO}_2$  was slightly in excess of 1.3 percent and that its solubility in the beta form did not exceed 0.4 percent.

This investigation has shown that most of the common oxides change the temperature of the alpha-beta inversion of  $2\text{CaO} \cdot \text{SiO}_2$  and that  $\text{Mn}_2\text{O}_3$  should be added to the list of known chemical inhibitors that prevent dusting.

## Chemical Constitution of Portland Cement Clinker

The chemical constitution of portland cement clinker in terms of definite compounds has been one of the principal subjects of study by the Portland Cement Association Fellowship at the Bureau. Recently, the work has centered in investigations of the manner in

which the alkalis,  $\text{Na}_2\text{O}$ , and  $\text{K}_2\text{O}$ , are combined in clinker. One phase of this research is reported in a paper by K. T. Greene and R. H. Bogue (RP1699) that will be published in the February number of the Journal of Research.

The region of the system that bears upon commercial cement compositions was examined and the various stable crystalline phases were determined. Particular attention was given to the compounds of  $\text{Na}_2\text{O}$ , or phases containing  $\text{Na}_2\text{O}$ , that are formed in the part of the above system that approaches portland cement clinker in composition. The results of the phase investigation are presented in tables and are shown graphically in phase diagrams.

It was found that the  $\text{Na}_2\text{O}$  may occur in various ways depending on the composition of the mixture and the heat-treatment it receives. Under certain conditions it may be combined as the compound  $\text{Na}_2\text{O} \cdot 8\text{CaO} \cdot 3\text{Al}_2\text{O}_3$ , or as a solid solution of this compound with  $3\text{CaO} \cdot \text{Al}_2\text{O}_3$ , which is a constituent of clinker. If cooling is rapid so that glass is produced, some of the  $\text{Na}_2\text{O}$  will be found in this glass. At high temperatures  $2\text{CaO} \cdot \text{SiO}_2$ , a constituent of clinker, can take up  $\text{Na}_2\text{O}$  and other oxides in solid solution, later precipitating them as inclusions of a  $\text{Na}_2\text{O}$ -bearing phase when the  $2\text{CaO} \cdot \text{SiO}_2$  undergoes inversion from the  $\alpha$  to the  $\beta$  crystalline form.

The results of the work indicate the manner in which  $\text{Na}_2\text{O}$  may be combined in portland cement clinker, but the conclusions are limited by the exclusion of certain components present in clinker, notably  $\text{Fe}_2\text{O}_3$ .

## Determination of Vinsol Resin in Portland Cement

Air-entraining portland cement containing inter-ground Vinsol resin is now being widely used. In the American Society for Testing Materials tentative method for determining the amount of Vinsol resin in cement, the resin is extracted with chloroform and its methoxyl content determined by the so-called methoxyl method. If it is known that Vinsol resin is the only substance extracted by chloroform, the resin content is often determined by weighing the dried chloroform extract according to the method for determining chloroform-soluble organic substances. Results obtained by the two methods frequently differ.

Leonard Bean and R. B. Peppler, of the Bureau, have made a study of the above methods. The drying temperature ( $57^\circ$  to  $63^\circ \text{C.}$ ) recommended in the extraction method was found to be too low to remove all chloroform. Drying at  $100^\circ \text{C.}$  for 15 minutes was satisfactory. In the methoxyl method, several factors were found to cause loss of methoxyl. Contact with hydrochloric acid and stannous chloride, as called for in the method, reduced the methoxyl content of the resin; increased time of contact caused increased loss; omission of stannous chloride reduced the loss. The resin was found to be reactive with sodium hydroxide

on digestion, and a determination by the methoxyl method is not recommended if the resin has been added as sodium resinate. Furthermore, because of the factors causing loss of methoxyl, which are difficult to control, it is doubtful whether quantitative results can be obtained by determinations of methoxyl.

## Heat Capacity of a Two-Phase System

Heat-capacity measurements are sometimes complicated by vaporization of material in the calorimeter. This often increases the heat capacity by several percent, and gives results that are not characteristic of the condensed phase. In the Journal of Research for February (RP1693), Harold J. Hoge derives formulas that can be used to correct for the presence of vapor, thus insuring the results that would be obtained if all the material in the calorimeter remained condensed. The advantage of these formulas over those previously available lies in the fact that the correction is expressed as a single term that may be readily transformed by Clapeyron's equation. This gives the experimenter a choice of two methods of making the vapor correction. In the past, authors have sometimes done much extra work because they were not aware that this choice existed.

Working formulas are given for making these cor-

rections to the heat capacity and to the heat of fusion for four different experimental procedures. These apply to calorimeters either with or without filling tubes, and to cases where the tare heat capacity is determined either with or without material in the calorimeter.

## Purification and Properties of 51 Hydrocarbons

The February number of the Journal of Research contains a report (RP1695) on the purification and properties of some paraffin, alkylcyclopentane, alkylcyclohexane, and alkylbenzene hydrocarbons, by Alphonse F. Forziati, Augustus R. Glasgow, Jr., Charles B. Willingham, and Frederick D. Rossini. The investigation forms part of the American Petroleum Institute's Research Project 6 on the "Analysis, purification, and properties of hydrocarbons." The report describes the purification and gives results of measurements of refractive index ( $n_D$  at 20° and 25° C.), density (at 20° and 25° C.), boiling point and pressure coefficient of the boiling point (at 1 atmosphere); and (except for 4 of the compounds) the freezing point, together with the calculated amount of impurity, of samples of 51 hydrocarbons, including 29 paraffins, 4 alkylcyclopentanes, 10 alkylcyclohexanes, and 8 alkylbenzenes.

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## Producer Gas as a Substitute Motor Fuel

A series of tests has been made at the Bureau by Clarence S. Bruce and F. A. Middleton on a four-cylinder stationary engine equipped to operate on either gasoline or producer gas from charcoal. These tests were made to determine the comparative consumption of charcoal and gasoline under various loads at engine speeds from 900 to 1,800 revolutions per minute. The optimum spark advance was determined for each fuel and operating condition. To illustrate the relative performance with gasoline and charcoal more graphically, the test data were used to calculate the road performance of a light truck which might logically be powered by the test engine. The "truck" used in these calculations was a 1½-ton model with 6.00-16 tires and a 4.16 rear axle ratio.

As set forth in the report on this work (RP1698), which will be published in the February Journal of Research, the calculations showed a gasoline mileage of 31.7 miles per gallon with an empty truck at 18 miles per hour, and 23.2 miles per gallon at 36 miles per hour. With the same truck fully loaded, the gasoline mileages at these speeds were respectively 24.2 and 19.3. On charcoal it was calculated that the same empty truck would travel 2.8 miles at 36 miles per

hour, and 2.0 miles at 18 miles per hour for each pound of charcoal burned. At the same speeds the distances travelled with the loaded truck per pound of charcoal burned would be respectively 2.1 and 1.6 miles. It was found that 1 gallon of gasoline was approximately equal to 11 pounds of charcoal in operating a gasoline engine of a common type. The performance of an engine using charcoal producer gas could be improved by supercharging.

To obtain maximum power with producer gas, the spark had to be much more advanced than with gasoline. The maximum power of the engine was reduced approximately 45 percent. There was considerable trouble in operation because of clogging of filters in the gas line. Starting usually required about 2 minutes, and with proper technique was not a problem.

Servicing requirements would make the use of gas producers impractical for the average automobile owner in this country. The loss in maximum engine power would place limits on loading, which might be a serious handicap, but would not prevent the use of producer gas as a substitute fuel. However, the authors of the paper feel that their work indicated that operation on any liquid fuel would be preferable to operation on charcoal.



## Fire Resistance of Ceiling Constructions

The fire resistance of the ceiling over the top story of a building is important in preventing the spread of a fire to the attic space, which often extends undivided over the whole, or a considerable proportion, of the structure. Attic fires spread rapidly on wooden construction, are difficult to control, and even though they may originate from a localized fire in one of the lower stories, can involve the entire building.

In connection with a project sponsored by the National Housing Agency, fire tests were made at the Bureau on typical ceiling constructions and, in addition, data (when applicable) were compiled from other tests that had been made of ceilings exposed as part of floor constructions.

The ceilings were found to give protection to supporting members and to prevent communication of fire for periods ranging from 8 minutes for wood lath and lime plaster to 60 minutes for a metal lath and plaster ceiling supported on steel joists. Protection in the range 11 to 16 minutes was given by gypsum boards or sanded gypsum plaster on gypsum or metal lath attached directly to wood joists. The protection was considerably increased by mineral wool insulation placed over metal lath and plaster ceilings suspended below wood joists.

## Douglas Fir Plywood Association's Prefabricated Building Panels

As part of the research which the Bureau is conducting on the structural properties of low-cost house constructions, the Douglas Fir Plywood Association submitted 75 specimens representing prefabricated plywood building panels of both lightweight stress-skin and commercial designs. Wall, partition, floor, and roof specimens were of the former type. Specimens of commercial type panels (2- by 4-inch studs) were for wall constructions only, and furnished a basis for comparison of strength and weight with the lightweight constructions.

As explained in Building Materials and Structures Report BMS 104, recently released, the wall specimens were subjected to compressive, transverse, concentrated, impact, and racking loads, the wall specimens of commercial type having included three different constructions for determining resistance to racking. The partition specimens were subjected to compressive, transverse, concentrated, and impact loads; the floor specimens to transverse, concentrated, and impact loads; and the roof specimens to transverse and concentrated loads. The floor and roof specimens included two different constructions for determining resistance to transverse loads. Transverse, concen-

trated, and impact loads were applied to both faces of wall specimens. The loads simulated those to which the elements would be subjected in actual service.

The deflection under load, and the sets after the load was removed, were measured for uniform increments of load. The results are presented in graphs and in tables; photographs and drawings clearly illustrate the constructions and methods of loading.

Copies of BMS104 are obtainable from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 25 cents each.

## Determining Small Amounts of Gold

As mentioned in Technical News Bulletin 343 (November 1945), many articles, especially jewelry, have on the surface a thin electrodeposited layer of gold. This layer not only produces an attractive color, but also retards corrosion and tarnish of the base metal.

As the wearing qualities of these articles largely depend on the thickness of the gold layer, an accurate method of determining it is desirable. In the Journal of Research for February (RP1694), W. Stanley Clabaugh describes such a method. A sample of the object to be tested is obtained by means of a punch and die designed to cut out samples of small area (1 square millimeter, or 0.00155 square inch) from material that has a total thickness of  $\frac{1}{32}$  inch or less. The sample cut out with the punch is treated with dilute nitric acid, which dissolves the base metal and leaves a small circular piece of gold. This is washed by decantation several times with water, and is then dissolved in a few drops of aqua regia, after which it is evaporated to dryness by impinging on the surface of the solution a jet of purified air. The quantity of gold from which the thickness of the gold layer is calculated is determined with a spectrophotometer from the intensity of yellow color produced when a measured volume of a solution of *o*-tolidine (3-3'-dimethylbenzidine), dissolved in normal sulfuric acid, is added to the air-dried residue.

Quantities of gold up to 10 micrograms (0.010 milligram), corresponding to 0.00050 millimeter (0.00002 inch) of gold on 1 square millimeter (0.00155 square inch) of surface, can be determined accurately by this method.

## Reproducibility of Lead Electrodes

Lead is a soft metal and anneals spontaneously at room temperature. There is evidence, however, that the thermodynamic properties of stick lead differ from those of electrolyzed crystals, which are presumably strain-free.

In a paper appearing in the February Journal of Research, (RP1697), Roger G. Bates, Murray Edel-

stein, and S. F. Acree report the results of a study of the reproducibility of four types of solid lead electrodes. The effects of surface condition and of air dissolved in the solutions used to compare the electrodes were investigated. Stick lead, etched in a solution of lead nitrate and nitric acid, forms very reproducible electrodes, particularly for use in an air-free solution of lead acetate or lead perchlorate.

The electromotive force between 8-percent lead amalgam and sticks cast from the NBS Standard Sample of lead, 49b, and "spectroscopically pure" lead was deter-

mined at 0° to 60° C. No difference between the two kinds of metal was apparent. The emf,  $E$ , in international volts is given as a function of centigrade temperature,  $t$ , by the equation,  $E = 0.005347 + 0.0000201t$ , and the differences at 25° C. in free energy,  $\Delta F$ ; entropy,  $\Delta S$ ; and heat content,  $\Delta H$ , between solid lead and saturated lead amalgam were found to be -1129 international joules, 3.9 international joules per degree, and 29 international joules, respectively. These quantities are in good agreement with the constants earlier assigned to electrolyzed lead crystals.

## ★ ★ ★ ★ ★ ★ ★ Conference on Foundry Practice

On December 4 the Bureau was host to a group of representatives of the uniformed and civilian personnel of various branches of the Navy Department. The occasion was a conference on foundry practice and problems, one of the series of such conferences initiated by the Bureau of Ships, Navy Department, in November 1944. The object of these conferences is to acquaint representatives of the administrative divisions of the Navy with the difficulties experienced by the foundrymen in putting designs into production and to provide an opportunity for representatives of the foundries of various Navy facilities to meet for discussion of their mutual problems. Representatives of the Bureau's Experimental Foundry were invited to participate in these conferences, because of the close connection that has been maintained between the Experimental Foundry and the Navy foundries in Washington, to their mutual benefit.

Previous meetings of the Foundry Conference had been held in Navy facilities, of the Eastern Coastal Area, concerned primarily with production problems and with foundry operations on a relatively large scale. The conference at the Bureau served to acquaint

the Navy foundrymen with the operation of a relatively small foundry which, nevertheless, is confronted by a wide variety of problems. Furthermore, the Bureau's foundry is unique in having available for consultation and advice the entire Bureau staff, including experts in all of the fields in which a foundryman might be interested.

Interest of the Navy personnel in the conference at the Bureau was evidenced by the presence of 51 representatives of the Bureau of Ships, Bureau of Ordnance, Naval Research Laboratory, and the Navy Yards at Portsmouth, N. H., Boston, Mass., New York, N. Y., Philadelphia, Pa., Washington, D. C., Portsmouth, Va., and Charleston, S. C. The morning session was devoted to discussion of research and operating problems of the Experimental Foundry. In the afternoon, a tour had been arranged through the foundry, other portions of the Division of Metallurgy, and places in the Bureau of interest to foundrymen, particularly the optical glass plant, where C. H. Hahner explained the foundry technique of melting and casting glass, the refractories laboratory (R. A. Heindl), and the large testing machines of the Engineering Mechanics Section, demonstrated by H. L. Whittemore.

## ★ ★ ★ ★ ★ ★ ★ Henry T. Wensel Becomes Assistant to the Director

Dr. Henry T. Wensel has been designated as Assistant to the Director to coordinate all Bureau activities relating to atomic energy. The appointment became effective on January 7.

Dr. Wensel first joined the Bureau's staff in 1917, and became chief of the Pyrometry Section in 1926. In 1940 he was selected to assist Dr. Briggs in the work of the original Uranium (S-1) Committee. Since 1942 he has been largely occupied with the administrative work of the Manhattan District, U. S. Army

Corps of Engineers. In the interval between the retirement of Dr. H. C. Dickinson and the appointment of Dr. F. G. Brickwedde, he served as acting chief of the Heat and Power Division (Technical News Bulletin 343 (November 1945)).

## Ferdinand G. Brickwedde Selected to Head Heat and Power Division

Effective January 7, Dr. Ferdinand G. Brickwedde was designated chief of the Bureau's Heat and Power

Division, succeeding Dr. H. C. Dickinson, who retired on October 31.

Dr. Brickwedde came to the Bureau in 1925 as research associate of the Munsell Color Co., and his early work was in the Colorimetry Section under Dr. I. G. Priest. The next year, however, he joined the Bureau's staff to take charge of the low temperature laboratory, succeeding Dr. C. W. Kanolt. He is principally known for his cryogenic researches and studies in fundamental thermodynamics and for the part he played, with Dr. H. C. Urey, then of Columbia University, in the discovery of heavy hydrogen. In March 1941 he received the annual Hillebrand Prize of the Chemical Society of Washington for his work on deuterium and its compounds, and the award of the Washington Academy of Sciences for distinguished services in physics, in particular, his researches on hydrogen and its isotopes, the low-temperature-scale, and the properties of liquid helium.

## Physical Chemistry and pH Standards

Following the retirement, on December 31, of Dr. S. F. Acree, chief of the Chemistry Division's section on pH Standards, that section was consolidated with the Physical Chemistry Section of the same division, under the title of "Physical Chemistry and pH Standards." Dr. Edgar R. Smith, formerly in charge of the Physical Chemistry Section, becomes chief of the new section.

## Galen B. Schubauer Heads Aerodynamics Section

Effective January 10, Dr. Galen B. Schubauer was designated chief of the Aerodynamics Section of the Mechanics and Sound Division, succeeding Dr. Hugh L. Dryden, who had headed the work of this section since 1920. When Dr. Dryden became chief of the division in 1934 he continued to devote a considerable part of his time to supervising the section's activities, but was obliged to drop this part of his work when appointed Assistant Director last December.

Dr. Schubauer came to the Electrical Division of the Bureau in 1929 and transferred to the Aerodynamics Section in 1930. He has established an international reputation as a research worker in his chosen field, through his careful experimental studies of the flow near the solid boundaries of immersed objects and of the statistical properties of turbulent air flow. An elliptical cylinder of dimensions used in his experiments has become widely known in the literature as "Schubauer's ellipse."

## New and Revised Publications Issued During January 1946

### JOURNAL OF RESEARCH<sup>1</sup>

Journal of Research of the National Bureau of Standards, volume 35, number 5, November 1945 (RP1676 to RP1680, inclusive). Price 30 cents. Annual subscription, 12 issues, \$3.50.

### RESEARCH PAPERS<sup>1</sup>

(Reprints from September and October 1945 Journal of Research)

- RP1668. An apparatus for photographing interference phenomena. James B. Saunders. Price 10 cents.  
RP1669. Lapped bar splices in concrete beams. Ralph W. Kluge and Edward C. Tuma. Price 10 cents.  
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### TECHNICAL NEWS BULLETIN<sup>1</sup>

Technical News Bulletin 345, January 1946. Price 5 cents. Annual subscription, 50 cents.

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LS815. List of Commercial Standards. (Supersedes LC803.)

## Recent Articles by Members of the Bureau's Staff Published in Outside Journals<sup>2</sup>

Thermodynamic properties of ethylbenzene vapor from 300° to 1,500° K. F. G. Brickwedde, M. Moskow, and R. B. Scott. J. Chemical Physics (57 East 55th St., New York 22, N. Y.) 13, No. 12, 547 (December 1945).

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<sup>2</sup> These publications are not obtainable from the Government, unless otherwise stated. Requests should be sent direct to the publishers.

Fire severity and fire resistance. S. H. Ingberg. Building Officials Digest. (Andrew C. H. Leak, Editor, Kalamazoo, Mich.) 19 (November 1945).

Development of approach and contact light systems. F. C. Breckenridge and C. A. Douglas. Illuminating Engineering (51 Madison Ave., New York 10, N. Y.) 40, 785 (November 1945).

Application of the spectrophotometer to colorimetry. Deane B. Judd. Engineering Experiment Station News (Ohio State University, Columbus, Ohio) 17, No. 5, 32 (December 1945).

Ultraviolet lamps for disinfecting purposes—present status. W. W. Coblenz. J. Am. Medical Assn. (535 North Dearborn St., Chicago, Ill.) 129, 1166 (December 22, 1945).

Building codes and good construction. George N. Thompson. Domestic Commerce (Department of Commerce, Washington 25, D. C.) 33, No. 12, 23 (December 1945).

Plastics in Germany, 1939-1945. G. M. Kline. Modern Plastics (122 East 42d Street, New York 17, N. Y.) 23, No. 4, 157 (December 1945).



